2-2

OPERATION and SERVICE

OSCAR MODEL K

Publication No. 447A

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section II
theory

2-1. GENERAL.

2-2. In this section Theory of Operation of the OSCAR Model K is treated at a technical level. Figure 2-1 is a block diagram of the equipment.

2-3. INTRODUCTION.

2-4. Major circuits of the OSCAR Model K comprise the Y-axis encoder and decoder, the time line counter, the channel counter, the readout scanner, the power supply, the patchboard, and the tape transport motors. Figure 2-1 shows the equipment connected for automatic operation of the time line counter and channel counter.

2-5. The amplitude reading of a trace at a particular time is set into the machine by use of the record amplitude control. This control is shaft-connected to the Datex C102 encoder in the reading head. Opening and closing of contacts within the decoder is translated into decimal digital form by the 22 decoder relays. These relays connect the decimal-digital Y-axis value to a three-decade bank of indicator lamps, and through the patchboard to contacts of the output scanner. The layout for the patchboard is shown on the schematic diagram.

2-6. The number of the trace being read is counted and stored in the channel counter. Channel count is displayed on a two-decade bank of indicator lamps, and also sent through the patchboard to contacts of the readout scanner. The channel counter can be triggered manually or automatically.

2-7. The time line count or abscissa of the record is counted and stored in the time line channel. Time line count is displayed on a four-decade bank of indicator lights, and also sent through the patchboard to contacts of the readout scanner. The time line counter can be triggered manually or automatically.

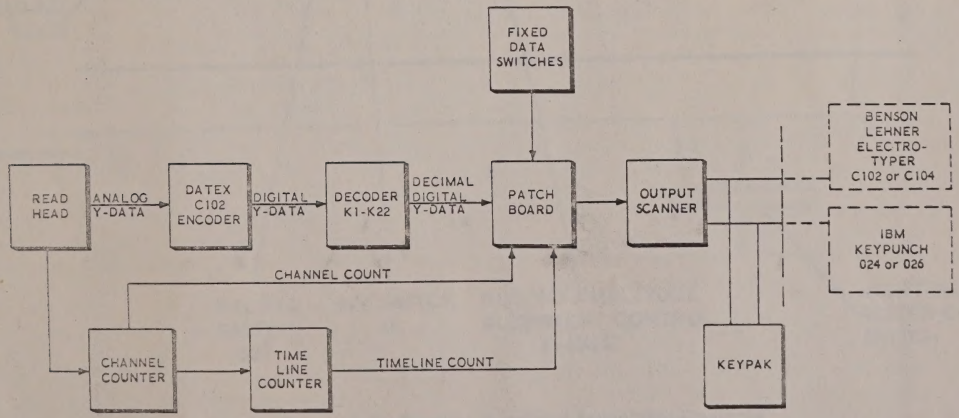

Figure 2-1. OSCAR Model K Block Diagram

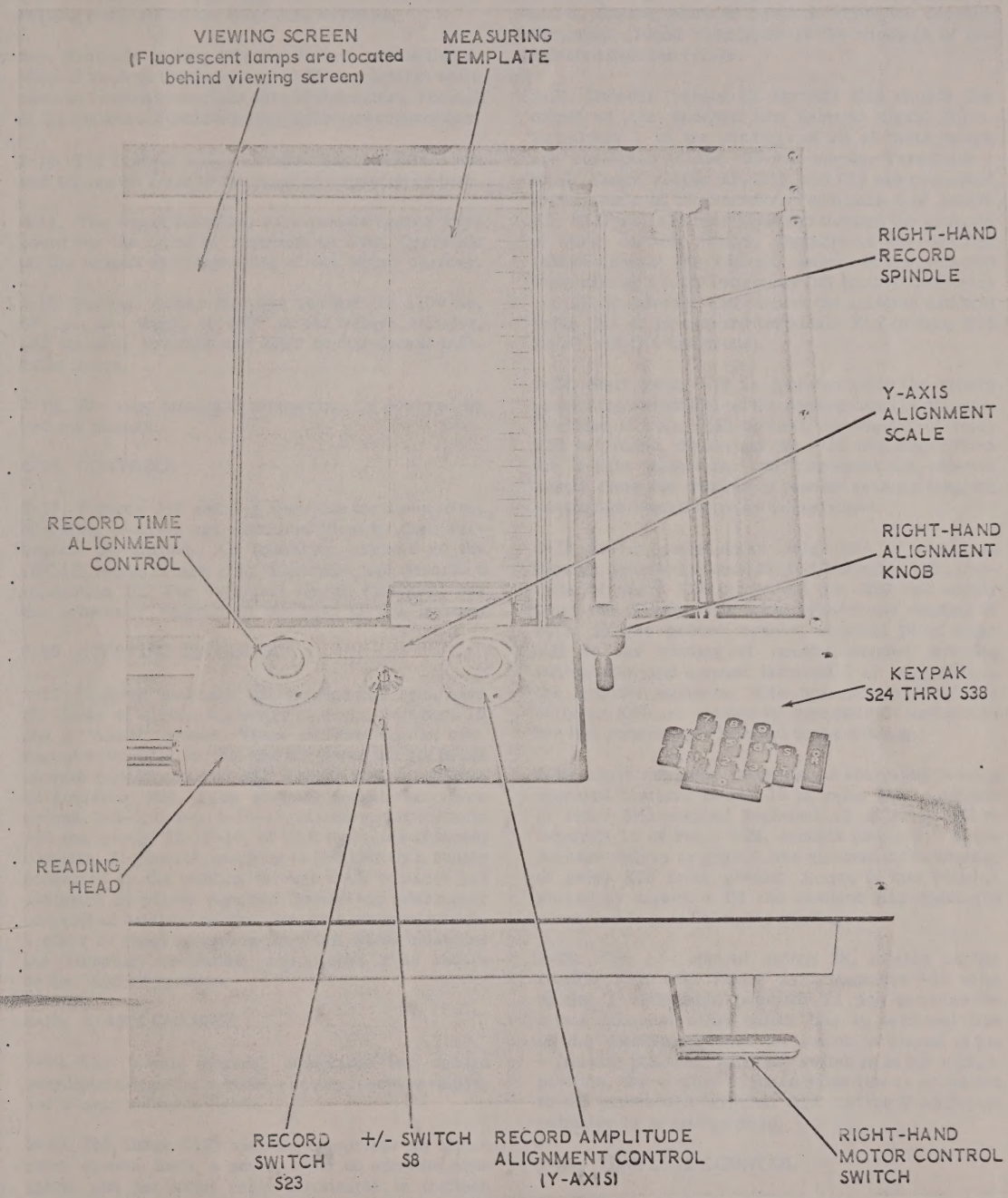

Figure 2-2. Reading Head and Associated Controls

2-8. Six digits of fixed data can be inserted into the readout program by the fixed data switches.

2-9. Readouts of two different format are available. Normal readout comprises up to 25 characters, while demand readout comprises up to 20 characters. Format of the readouts is controlled by patchboard connections.

2-10. The readout scanner scans the accumulated data and transmits them to the typer or keypunch or both.

2-11. The kepak functions as a remote control keyboard for the typer or keypunch or both. Operation of the keypak is independent of the output scanner.

2-12. Internal power supplies convert the 115V ac, 60 cps, a-c supply to +80V dc for relays, encoder, and stepping switches and 230V dc for decade indicator lamps.

2-13. The tape transport mechanism is powered by two a-c motors.

2-14. CONTROLS.

2-15. Figures 2-2 and 2-3 show the locations of the operating controls and identifies them by their reference designators. All operating controls of the OSCAR Model K are also illustrated and described in Section III. For technical circuit functions, see the schematic diagram at the back of this manual.

2-16. STEPPING SWITCHES.

2-17. Stepping switches SS1 through SS8 each have six decks of eleven stationary contacts, 0 through 10 and a "home" contact. These switches can be connected externally so that the wipers of the six decks operate simultaneously, SS1 through SS7, or operate in sequence, SS8. Each stepping switch has three groups, 3-4-5, 6-7-8, 9-10-11, of interrupter contacts and one group, 12-13-14, of OAH (operates at home) contacts. In general, stepping is initiated by a supply connected to the winding through OAH contacts and continued by pulses supplied through the interrupter contacts of external relays. For each stepping switch, a clear or reset control is provided, which unlatches the stepping mechanism and causes it to return to the "home" position.

2-18. Y-AXIS CHANNEL.

2-19. The Y-axis channel comprises the record amplitude alignment control, encoder, decoder relays, and Y-axis indicator lights.

2-20. The Datex C102 encoder comprises an alignment control knob, a scale, a set of enclosed contacts, and an output cable terminated in thirteen pin receptacle J14. Y-axis analog data are encoded into digital form by the opening and closing of contacts within the encoder as the alignment knob is turned. The common terminal of the decoder is connected to ground through K24-9 and 10, and K23-5 and 6. Closing pairs of contacts within the decoder furnishes ground connection to the windings of the selected decoder relays.

2-21. Decoder relays K1 through K22 decode the output of the encoder into decimal digital form. Terminals 1 of the windings of all of these relays are connected to the 80-volt supply. Terminals 4 of all except relays K5, K12, and K13 are connected to terminals of the encoder. Terminals 4 of relays K5, K12, and K13 are grounded through the contacts of other decoder relays. Contacts of the decoder relays connect the 230-volt supply to the selected terminals of Y AXIS indicators DS1 (units), D52 (tens) and DS3 (hundreds), and connect the selected common value line to patchboard terminals F14 (units), E14 (tens), and D14 (hundreds).

2-22. Start relay K23 is operated when the record pushbutton switch S23 on the reading head is pressed. Contacts of relay K23 connect the winding of relay K24 to ground, disconnect the -230 volt supply from the Y-axis indicators, and disconnect the +80-volt supply from the winding of readout scanner stepping switch SS8 when this relay is energized.

2-23. Set-up pulse delay relay K24 is energized through operated contacts 6 and 7 of relay K23. Contacts of relay K24 disconnect the -230 volt supply from the Y-axis indicators, connect the winding of relay K43 to ground, connect terminal 14 of relay K23 to the winding of readout scanner stepping switch SS8, and connect terminal 5 of relay K23 to the encoder common. Both operation and release of relay K24 are slowed by capacitor C1 and resistor R13 connected in parallel to the winding.

2-24. Start interlock relay K43 is energized through operated contacts 12 and 13 of relay K24. Contacts of relay K43 connect terminal 13 of relay K24 to terminal 12 of relay K29, connect contacts 7 of the decoder relays to ground, and disconnect the winding of relay K23 from ground. Action of this relay is slowed by capacitor C8 and resistor R12 which are connected in parallel to the winding.

2-25. The +/- control switch S8, located on the reading head (see figure 2-2), connects +80 volts to the Y AXIS sign indicator I1 and connects the minus common value output line to terminal G14 of the patchboard when the switch is placed in the - (minus) position. When the switch is in the + (plus) position, the +/space common value line is connected to the patchboard terminal G14, and the Y AXIS sign indicator I1 is extinguished.

2-26. TIME LINE COUNTER.

2-27. The time line counter maintains a count of the time coordinate (abscissa) of the record. Count may be manual or automatic. The count is indicated on a four-decade digital display (DS6 through DS9) and

connects the selected common value lines to the patchboard for typing or punching. The time line count can be automatically multiplied by a single digit. The single digit multiplier can be applied to any of the four decades. Manual CLEAR ENTER switches (S15 through S18) are provided for each decade.

2-28. Major components of this channel comprise multiplier stepping switch SS1, units stepping switch SS5, tens stepping switch SS4, hundreds stepping switch SS3, thousands stepping switch SS2, multiplier start relay K42, and time line counter controlled ignore relays K25 and K26.

2-29. Manual controls of this channel include TIME LINE COUNTER MAN.-AUTO.-COUNT ONLY mode selector switch S14, TIME LINE COUNTER decade selector switch S19, and CLEAR ENTER switches (S15 through S18) for each decade.

2-30. With mode selector switch S14 set in the MAN. or AUTO. position, a time line count advance pulse is received from the patchboard and multiplier start relay K42 operates. Multiplier stepping switch SS1 steps to the count set up on TIME LINE COUNTER decade selector switch S19 and causes the selected stepping switch to advance one digit per step of stepping switch SS1. In this manner, the time count in the selected decade is advanced by the digit set into TIME LINE COUNTER decade selector switch S19.

2-31. With decade selector switch S19 in the unit decade and TIME LINE COUNTER MULTIPLIER switch S20 set to their positions 1, units decade stepping switch SS5 advances one position per time line count. When stepping switch SS5 reaches position 10, a pulse is connected to tens decade stepping switch SS4 causing it to advance one position and stepping switch SS5 returns to its "home" position. When stepping switch SS4 reaches its position 10, a pulse is connected to hundreds decade selector switch SS3 causing it to advance one position and stepping switch SS4 returns to its "home" position. When stepping switch SS3 reaches position 10, a pulse is connected to thousands decade stepping switch SS2 causing it to advance one position, and stepping switch SS3 returns to its "home" position. When stepping switch SS2 reaches position 10, it resets.

2-32. With TIME LINE COUNTER decade selector switch S19 set in any position other than "units" the time line count starts in the selected decade and proceeds to the remaining higher decades. The stepping switches of decades inferior to the selected decade remain stationary.

2-33. When a decade CLEAR-ENTER switch (S15 through S18) is placed in the CLEAR position, the associated stepping switch steps to its position 10 and returns to its "home" position. When the CLEAR-ENTER switch is placed in the ENTER position, the corresponding stepping switch steps one digit.

2-34. CHANNEL COUNTER.

2-35. The channel counter maintains a count of the trace being read, indicates the channel count on a two-lamp digital display, and connects the selected common value line to the patchboard for typing or

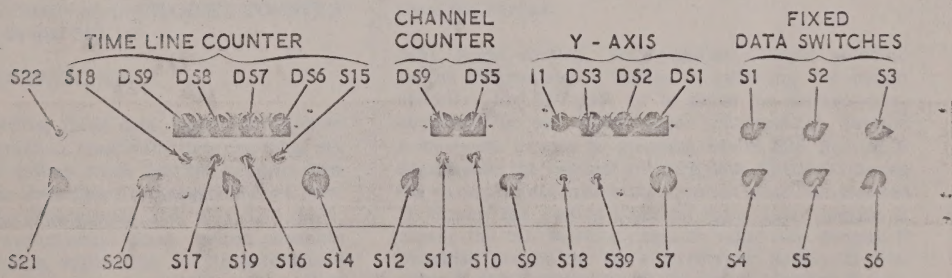
TIME LINE COUNTER
CHANNEL COUNTER
Y - AXIS
FIXED DATA SWITCHES
S22 S18 DS9 DS8 DS7 DS6 S15
DS9 DS5
I1 DS3 DS2 DS1
S1 S2 S3
S21 S20 S17 S19 S16 S14 S12 S11 S10 S9 S13 S39 S7
S4 S5 S6

Figure 2-3. Control Panel

punching. This counter resets itself after the last trace is read. Controls provide for setting the number of channels being read, and enter and clear functions for both decades.

2-36. Major circuit components in this channel consist of units counter stepping switch SS7, tens counter stepping switch SS6, units indicator DS4, tens counter indicator DS5, and clear feedback control relay K28.

2-37. Units decade stepping switch SS7 is connected to step when a time line count advance pulse is received from the patchboard. Also, when units CLEAR-ENTER switch S10 is placed in the ENTER position, stepping switch SS7 steps to the digit set in CHANNEL COUNTER units selector switch S9. Stepping switch SS7 releases and returns to position 1 when CLEAR-ENTER switch S10 is moved to the CLEAR position. In stepping switch SS7, deck 1 provides stepping pulses; deck 2 connects the selected common value line; deck 3 connects the -230 volt supply to the selected terminal of units indicator DS4; and deck 4 is not connected. Contacts 1 through 9 of deck 5, of stepping switch SS7, distribute clear voltage received from tens decade stepping switch SS6, and contact 10 connects a start pulse to tens decade stepping switch SS6.

2-38. Tens decade stepping switch SS6 is connected to step when a start pulse is received from stepping switch SS7. Also when tens CLEAR-ENTER switch S11 is placed in the ENTER position, stepping switch SS6 steps to the digit set in the CHANNEL COUNTER tens selector switch S12. Stepping switch SS6 releases and returns to its "home" position when CLEAR-ENTER switch S11 is moved to the CLEAR position. The six decks of stepping switch SS6 are connected much like the corresponding decks of stepping switch SS7 (see paragraph 2-37). Deck 5 of stepping switch SS6 furnishes reset voltage to deck 5 of stepping switch SS7.

2-39. Clear feedback and control relay K28 operates when either CLEAR-ENTER switch S10 or S11 is placed in the CLEAR position, and when the channel count reaches the count set in CHANNEL COUNTER selector switches S9 and S12.

2-40. FIXED DATA SWITCHES.

2-41. Twelve-position, fixed data, selector switches S1 through S6 furnish a means for programming six digits, spaces, or minus signs into the readout. The wipers of selector switches S1 through S6 are connected to patchboard terminals J14, K14, L14, M14, N14, and P14, respectively. Each switch connects the selected common value line to its patchboard terminal, where the selected character can be patched into either the demand or normal readout program.

2-42. KEYPAK.

2-43. The keypak (see figure 2-2) is a numerical and function remote control keyboard which operates the externally connected electrotyper or punch at any time except during normal or demand readout scanning. Electrically, each key is a spring-loaded normally-open switch (S24 through S28). When the key is pressed, the 80-volt potential is connected to the winding of the corresponding output relay, and in turn to the output connector. Exceptions are the T (tab), (.) period, and CR (carriage return) keys. CR key (switch S24), T key (switch S25), and the period (.) key (switch S27) connect the 80-volt potential directly to the corresponding terminals of TYPER connector J1.

2-44. OUTPUT CIRCUITS.

2-45. The schematic diagram shows 12 common output value lines. Each is connected to terminal 1 of the winding of an output relay. Each output relay controls the output to a particular digit in the typer or punch.

2-46. The common value output lines are connected to the respective contacts of Y-axis decoder relays K1, K3, K8, K10, K16, and K18, stepping switches SS2 through SS7, fixed data switches S1 through S6, and the keypak.

2-47. The related switch wiper is connected through the patchboard to a particular contact of output scanner stepping switch SS8.

2-48. When the wiper of stepping switch SS8 reaches a particular contact, the 80-volt supply is connected through the contact of stepping switch SS8, the patchboard, and the selection device to the winding of the selected output relay.

2-49. The selected output relay operates and connects the 80-volt supply to the selected key solenoid of the typer and closes the circuit to the winding of the selected punch magnet in the keypunch.

2-50. In addition to the ten digits, -(minus) and space provided by the output relays, T (tab), (.) period, and CR (carriage return) functions are provided directly from the keypak.

2-51. Eight-section, four-position, output selector switch S7 provides a means of switching the output circuitry for SET UP, or to drive the electrotyper, keypunch, or both electrotyper and keypunch. Section A connects ground to stepping switch SS8. Section B establishes the readout advance path. Section C closes the carriage return function common value line. Section D closes the period common value line. Section E closes the tab function common value line. Section F provides ground for the electrotyper. Section G provides ground return for the keypunch. Section H provides a return connection for the keypak.

2-52. NORMAL READOUT CYCLE.

2-53. When power is applied to the OSCAR Model K off-normal isolation relay K2 operates and connects

punching. This counter resets itself after the last trace is read. Controls provide for setting the number of channels being read, and enter and clear functions for both decades.

2-36. Major circuit components in this channel consist of units counter stepping switch SS7, tens counter stepping switch SS6, units indicator DS4, tens counter indicator DS5, and clear feedback control relay K28.

2-37. Units decade stepping switch SS7 is connected to step when a time line count advance pulse is received from the patchboard. Also, when units CLEAR-ENTER switch S10 is placed in the ENTER position, stepping switch SS7 steps to the digit set in CHANNEL COUNTER units selector switch S9. Stepping switch SS7 releases and returns to position 1 when CLEAR-ENTER switch S10 is moved to the CLEAR position. In stepping switch SS7, deck 1 provides stepping pulses; deck 2 connects the selected common value line; deck 3 connects the -230 volt supply to the selected terminal of units indicator DS4; and deck 4 is not connected. Contacts 1 through 9 of deck 5, of stepping switch SS7, distribute clear voltage received from tens decade stepping switch SS6, and contact 10 connects a start pulse to tens decade stepping switch SS6.

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2-47. The related switch wiper is connected through the patchboard to a particular contact of output scanner stepping switch SS8.

2-48. When the wiper of stepping switch SS8 reaches a particular contact, the 80-volt supply is connected through the contact of stepping switch SS8, the patchboard, and the selection device to the winding of the selected output relay.

2-49. The selected output relay operates and connects the 80-volt supply to the selected key solenoid of the typer and closes the circuit to the winding of the selected punch magnet in the keypunch.

2-50. In addition to the ten digits, -(minus) and space provided by the output relays, T (tab), (.) period, and CR (carriage return) functions are provided directly from the keypak.

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2-52. NORMAL READOUT CYCLE.

2-53. When power is applied to the OSCAR Model K off-normal isolation relay K2 operates and connects

the winding of start relay K23 to the normally open contact of record switch S23. When record push-button switch S23 is pressed, the winding of start relay K23 is connected to ground and relay K23 operates.

2-54. Operation of relay K23 connects the winding of set-up pulse delay relay K24 to ground and relay K24 operates. Action of relay K24 is slowed by capacitor C1 and resistor R13.

2-55. Operation of relay K24 connects the winding of start interlock relay K43 to ground and relay K43 operates. Action of K43 is slowed by capacitor C8 and resistor R12. Relay K43 is electrically self-locked while record switch S23 is held pressed.

2-56. Operation of relay K43 disconnects the winding of relay K23 from ground. Release of relay K23 disconnects the winding of relay K24 from ground and causes relay K24 to release.

2-57. During the period between release of fast-acting relay K23 and release of slow-acting relay K24, the 80-volt supply is connected to the winding 1-2 of readout scanner stepping switch SS8 through contacts 14 and 15 of relay K24, and contacts 15 and 16 of relay K23, and the rotor of stepping switch SS8 moves from its "home" position.

2-58. The second and following pulses are connected to the winding of stepping switch SS8 through contacts 6 and 7 of typer feedback relay K45, punch feedback relay K46, or both, depending upon the position of Y AXIS output selector switch S7.

2-59. In the typer timing feedback, fixed data switch S5 connects the 80-volt supply to the winding of relay K45 (in the OSCAR Model K) when closed by the ribbon actuating link.

2-60. In the keypunch the cam feedback switch connects the 80-volt supply to the winding of relay K46 (in the OSCAR Model K) when it is closed by a punch magnet cam.

2-61. During the period when the wiper of stepping switch SS8 is on an output contact, the 80-volt supply is connected to the wiper through OAH contacts 12 and 13 and interrupter contacts 3 and 5.

2-62. Contacts 5-6-7 of readout control relay K27 also connect the output pulses of the selected wiper of stepping switch SS8. When DEMAND READOUT switch S13 is pressed, relay K27 operates and transfers the output pulses from the wiper of decks 4, 5, and 6 of stepping switch SS8 to the wiper of decks 1, 2, and 3.

2-63. DEMAND READOUT.

2-64. In demand readout the supply to start stepping switch SS8 comes through DEMAND READOUT switch S13. Readout control relay K27 operates, and transfers the 80-volt supply from the wiper of decks 4-5-6 of stepping switch SS8 to the wiper of decks 1-2-3. The balance of the readout cycle is identical to the normal readout process, except for program variations provided by patchboard connections.

2-65. POWER SUPPLY.

2-66. The OSCAR Model K requires 500 watts of 60 cps a-c power at 105 to 125 volts. Power is connected into the equipment through connector receptacle J3 (see figure 3-2). Power ON-OFF switch S2 provides a means of switching power to both the OSCAR Model K and the printer or punch device connected to power output receptacle J4. Fuse F1 protects the coding circuits and fuse F2 protects the fluorescent lamps, tape transport motors, and brake solenoids. Power out receptacle J4 is not fused.

2-67. Windings of the 46 relays and 8 stepping switches are powered by the 80-volt rectifier. Power is coupled through isolation transformer T1 to a rectifier bridge consisting of semiconductor diodes CR1 through CR4. Output of the rectifier bridge is filtered by inductor L1 and C5. Resistor R11 serves as a load resistor for this circuit.

2-68. A 230-volt supply is required for the nixie indicator lamps. A voltage doubler circuit consisting of semiconductor diodes CR38 and CR39, and capacitors C6 and C7 connected to the secondary winding of transformer T1 produce the 230-volts dc.

2-69. ILLUMINATION.

2-70. Illumination of the viewing screen is provided by fluorescent lamps DS11 through DS14 located behind the viewing screen. The ON-1-2 illumination selector switch S21 controls the power to these lamps. When switch S21 is placed in position 1, two of the fluorescent lamps are lighted. When switch S21 is placed in position 2, all four of the fluorescent lamps are lighted. Ballast transformers RT1 and RT2 serve lamps DS11 and DS12, and DS13 and DS14, respectively.

2-71. TAPE TRANSPORT MECHANISM.

2-72. The tape transport mechanism holds the oscillograph record in place for reading, maintains tension to keep the record flat, and moves the record either to the right or to the left. The motors, solenoid brakes, spindles, magnetic record holders, and alignment knobs and associated mechanism comprise the tape transport.

2-73. Tape transport motors M1 and M2 are coupled through worm gear drives to the left-hand and right-hand record spindles, respectively. Spindle brakes are operated by solenoids KS1 and KS2. The motors and brakes are controlled by means of mercury

switches S40 and S41. These switches are connected so that either control switch applies power to its motor and disconnects power from both solenoids when the control lever is pressed. When both motor control switches are in their normal positions, power is applied to both brake solenoids.

2-74. ALIGNMENT KNOBS.

2-75. The alignment knobs (see figure 2-2) serve to clamp the reading head traverse bar in the position required to align the reading head to the record.

2-76. The record spindles hold the portions of the record not on the viewing screen, transport the record, and help to hold it in place for reading. Each spindle has an adapter for connection to the motor, one flange, a shaft, and a locking bar to clamp the record to the shaft.

2-77. The right-hand and left-hand magnetic tape holders are smoothly finished magnetized bars. These bars are mounted at either side of the viewing screen and serve to hold the tape flat on the viewing screen.

2-78. READING HEAD.

2-79. The reading head carries the reference line overlay which moves the reading head. Motion along the reading head traverse bar is controlled by the record time alignment knob.

2-80. The record amplitude alignment knob is shaft-coupled to the encoder, and also controls the position of the scaled amplitude overlay. A scale on the top of the reading head gives a rough indication of the position of the scaled amplitude overlay.

2-81. Reading the record is accomplished by aligning the time reference line over the time coordinate (abscissa) of the record, and moving the scaled amplitude overlay until its calibration also intersects the intersection of the trace being read and the time reference line. For more detail about reading processes, see Section III.

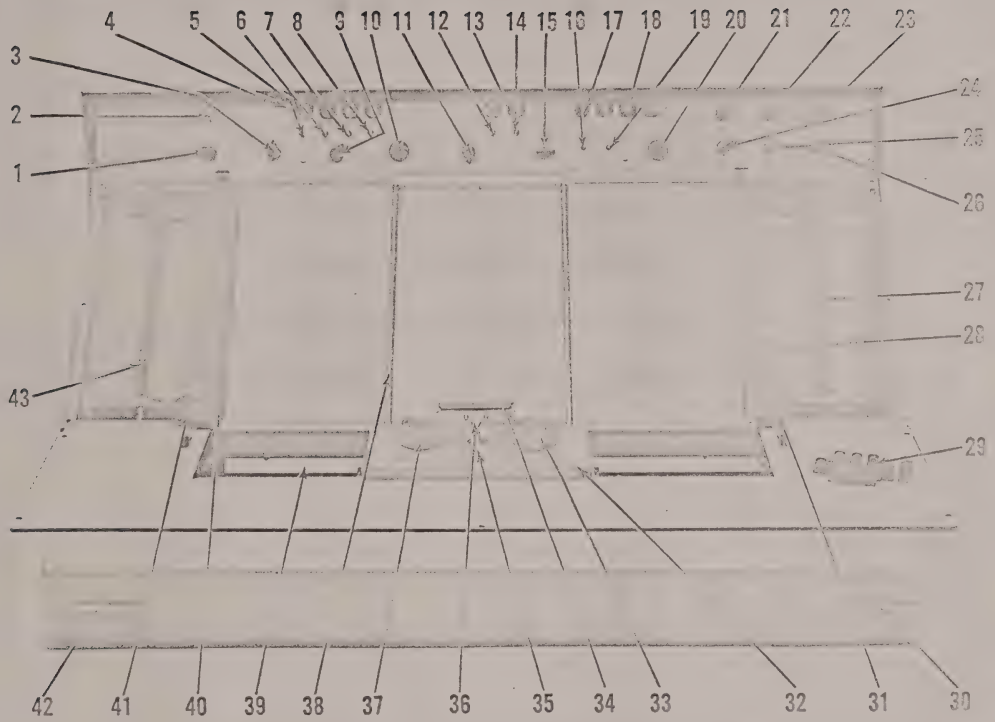


Figure 3-1. Location of Operating Controls and Indicators

section III
operation instructions

3-1. INTRODUCTION.

3-2. Instructions for operating the Benson-Lehner OSCAR Model K are contained in this section. Operating controls are illustrated and identified in figure 3-1. Table 3-1 describes the function of each operating control. Instructions for connecting the equipment are contained in paragraphs 3-3 through 3-6. Instructions for installing the record are contained in paragraphs 3-7 through 3-13. Preparation and use of various types of overlays are treated in paragraphs 3-14 through 3-32. Procedure for typical operation is given in paragraphs 3-33 through 3-36.

TABLE 3-1. OPERATING CONTROLS AND INDICATORS

FIGURE 3-1 INDEX NO.	NAME OF CONTROL	REFERENCE DESIGNATOR	FUNCTION OF CONTROL
1	OFF-1-2 illumination selector	S21	Three-position rotary switch which provides for selection of the intensity of illumination of the viewing screen. When this switch is placed in position 1, two fluorescent lamps are lighted; in position 2, four lamps are lighted.
2	Power ON-OFF switch	S2	Provides power switching for all lamps and data reduction circuits in the OSCAR Model K.
3	TIME LINE COUNTER MULTIPLIER switch	S20	Ten-position rotary switch which provides a means for selecting a one-digit multiplier for the time line counter. The time line count advances at a rate determined by the positions of this switch and the TIME LINE COUNTER decade selector switch S19. For example: if the MULTIPLIER switch S20 is set to position 5 and the decade selector switch S19 is set to the "tens" decade position, the time line count advances 50 counts per reading.
4	TIME LINE COUNTER indicators (nixie bank)	DS6, DS7, DS8, and DS9	This bank of nixie tubes indicate the time at the last readout on the total accumulated time count.

TABLE 3-1. OPERATING CONTROLS AND INDICATORS - Continued

FIGURE 3-1 INDEX NO.	NAME OF CONTROL	REFERENCE DESIGNATOR	FUNCTION OF CONTROL
5, 6, 7, and 8	TIME LINE COUNTER CLEAR-ENTER switches	S15, S16, S17, and S18	Two-position toggle switches which provide a means of entering extra counts when placed in the down position, or returning a time count decade when placed in the up position. Switch S18 (5) switches the thousands decade. Switch S17 (6) switches the hundreds decade. Switch S16 (7) switches the tens decade. Switch S15 (8) switches the units decade.
9	TIME LINE COUNTER decade selector switch	S19	Four-position rotary switch which provides a means for selecting the decade at which the time count advances between readings.
10	TIME LINE COUNTER MAN.-AUTO.-COUNT ONLY mode selector switch	S14	Three-position rotary switch which provides a means for selecting the mode of operation. When this switch is placed in the MAN. position, the operator can read out the stored count by pressing the DEMAND READ-OUT switch (16). When this switch is placed in the AUTO. position, the time line count is displayed on the TIME LINE COUNTER indicators (4) and the time line counter automatically advances at a rate determined by the settings of the TIME LINE COUNTER MULTIPLIER switch (3) and the TIME LINE COUNTER decade selector switch (9). When this switch is placed in the COUNT ONLY position, time line count entries are displayed on the TIME LINE COUNTER indicators (4) but are not read out until the DEMAND READOUT switch (16) is pressed.
11	CHANNEL COUNTER tens decade selector switch	S12	Ten-position rotary switch which, when used in combination with CHANNEL COUNTER units decade selector switch (15), provides a means for selecting the trace number at which the channel counter resets to zero. These selector switches are set at one digit higher than the number of traces to be read. For example: when reading a 12-trace record, the tens decade selector switch (11) is set to position 1, and the units decade selector switch (15) is set to position 3. After the twelfth channel has been read the channel counter advances to 13 and then resets to zero.

TABLE 3-1. OPERATING CONTROLS AND INDICATORS - Continued

FIGURE 3-1 INDEX NO.	NAME OF CONTROL	REFERENCE DESIGNATOR	FUNCTION OF CONTROL
12	CHANNEL COUNTER CLEAR-ENTER units decade switch	S11	Two-position toggle switch which, in combination with CHANNEL COUNTER CLEAR-ENTER tens decade switch (14), provides a means of entering extra channel counts when placed in the down position, or returning the decade to zero when placed in the up position.
13	CHANNEL COUNTER indicators (nixie bank)	DS4 and DS5	This bank of two nixie tubes indicates the number of the trace the operator is reading.
14	CHANNEL COUNTER CLEAR-ENTER tens decade switch	S10	Same as index (12) above.
15	CHANNEL COUNTER units decade selector switch	S9	Refer to index (11) on the preceding page.
16	DEMAND READOUT pushbutton switch	S13	This pushbutton switch provides a means of initiating a readout of special format when the TIME LINE COUNTER MAN.-AUTO.-COUNT ONLY mode selector switch (10) is in the MAN. or COUNT ONLY position.
17	Y AXIS sign indicator	I1	This indicator displays the sign of the Y-axis reading. This indicator is controlled by the +/- control switch (35) on the reading head.
18	Y AXIS indicators (nixie bank)	DS1, DS2, and DS3	This bank of three nixie tubes indicate the amplitude of the trace being read.
19	RESET pushbutton switch	S39	Provides a means for resetting the output scanner (readout stepping switch).
20	SET UP-TYPER-TYPER/PUNCH-PUNCH output selector switch	S7	Four-position rotary switch which provides a means of selecting the SET UP function or connections compatible with the output equipment. When this switch is in the SET UP position, the READOUT switch (36) and the DEMAND READOUT switch (16) are disabled. Output positions comprise: TYPER (Benson-Lehner Electrotyper Model C or Model G), TYPER/PUNCH (both Electrotyper and IBM Keypunch Type 024 or Type 026, or paper tape punch), and PUNCH (IBM Keypunch Type 024 or Type 026, or paper tape punch).
21 thru 26	Fixed data selector switches	S1 thru S6	Twelve-position rotary switches which provide a means of programming six characters into the readout. These switches can be connected at the patch board to insert fixed characters into the readout format according to customer program requirements. Digits zero through 9, minus sign (-), and OMIT function are provided.

TABLE 3-1. OPERATING CONTROLS AND INDICATORS - Continued

FIGURE 3-1 INDEX NO.	NAME OF CONTROL	REFERENCE DESIGNATOR	FUNCTION OF CONTROL
27	Right-hand record spindle	-	Used in combination with the left-hand record spindle (43) to hold the portions of the record not over the viewing screen, draw the record over the viewing screen, and maintain tension on the record. The spindles can be lifted out of the equipment by pulling the top end away from the console and lifting out of the console. A clamp bar holds the end of the record. Motion of the spindles is controlled by the motors, solenoid brakes, and motor control switches.
28	Right-hand magnetic record holder	-	Used in combination with the left-hand magnetic record holder (40) to clamp the record to the viewing screen without wrinkling for accurate reading. The magnetic record holders are magnitized bars hinged at the bottom.
29	Keypak	S24 thru S38	The keypak is a group of 15 keys which serve as a remote control keyboard for the output equipment. Digits zero through 9, CR (carriage return),T(tab), S (+/space), period (.), and (-) are provided. Reference designators are as follows: S24A-B - CR (carriage return) S25 - T (tab) S26 - S (+/space) S27 - (.) period S28 - 0 (zero) S29 through S37 - 1 through 9 S38 - (-) minus
30	Right-hand motor control switch	S40	Pressing this switch connects power to the right-hand motor and releases both the right- and left-hand brakes. The record moves to the right as long as the lever is held down. Upon release of the lever, power is removed from the right-hand motor and both brakes are applied to stop and hold the record.
31	Right-hand record alignment knob	-	Used in combination with the left-hand record alignment knob to provide a means for clamping the ends of the reading head traverse bar (39) in position to align the reading head to the horizontal reference line on the record.
32	Reading head	-	The reading head is mounted on the traverse bar (39), and carries the reference line overlay (38) and measurement overlay along the record. The reading head contains the record amplitude alignment control (33), record time alignment control (37), the Y-axis

TABLE 3-1. OPERATING CONTROLS AND INDICATORS - Continued

FIGURE 3-1 INDEX NO.	NAME OF CONTROL	REFERENCE DESIGNATOR	FUNCTION OF CONTROL
32 (Cont)			alignment indicator (34), record push-button switch (36), and the +/- control switch (35).
33	Record amplitude alignment control knob	-	This knob positions the encoder which is housed within the reading head. When the operator sets the knob to correspond to the Y-axis value read from the record, the Y AXIS indicator lights on the control panel indicate the amplitude, and relays are set up to print or punch the reading when the record pushbutton switch (36) on the reading head, or the DEMAND READ-OUT switch (16) on the control panel, is pressed.
34	Y-axis alignment indicator	-	This indicator is driven by the record amplitude alignment control knob (33) and provides the operator with an approximate indication of the position of the record amplitude alignment control.
35	+/- control switch	S8	Two-position toggle switch. When this switch is placed in the - (minus) position, it lights the Y AXIS sign indicator (17) and sets up relays to type a minus sign before the three Y-axis amplitude digits in the readout. When this switch is placed in the + (plus) position, it extinguishes the Y AXIS sign indicator (17) and causes a space to precede the Y-axis digits in the readout.
36	Record pushbutton switch	S23	This switch is located in the center of the reading head (32) and is the trigger by which the operator initiates the normal readout cycle. When this switch is pressed, normal readout is started; the channel counter advances one count, and the time line counter advances one count (or the number of counts set up on the TIME LINE COUNTER MULTIPLIER and associated decade selector switch).
37	Record time alignment control knob	-	This knob drives the reading head right or left along the traverse bar.
38	Reference line overlay	-	The reference line overlay consists of a sheet of clear glass mounted in a metal frame. The metal frame is mounted in the reading head. The overlay glass has horizontal lines etched along the right- and left-hand edges. During operation, these horizontal lines are aligned with a horizontal reference on the record by means of the record alignment knobs.

TABLE 3-1. OPERATING CONTROLS AND INDICATORS - Continued

FIGURE 3-1 INDEX NO.	NAME OF CONTROL	REFERENCE DESIGNATOR	FUNCTION OF CONTROL
39	Traverse bar	-	The traverse bar supports the reading head (32) and the associated reference line overlay (33). Positioning of the traverse bar is accomplished by loosening either of the record alignment knobs (33 and 37) and positioning the traverse bar so that the scales on the reference line overlay are aligned to the horizontal reference line on the record.
40	Left-hand magnetic record holder	-	Same as index(28) on page 3-4.
41	Left-hand record alignment knob	-	Same as index(32) on page 3-4.
42	Left-hand motor control switch	S41	The left-hand motor control switch functions the same as the right-hand motor control switch (30) except that the record is drawn to the left.
43	Left-hand record spindle	-	Same as index(27) on page 3-4.

3-3. CONNECTION FOR OPERATION.

3-4. Connect the flat plug of the power cord to the receptacle on the power input panel located under the console of the OSCAR Model K (see figure 3-2). Connect the other end of the power cord to a 3-terminal 115V ac power outlet.

3-5. If a Benson-Lehner Electrotyper Model 102C or Model 102G is to be used connect its signal cable to the TYPER outlet receptacle on the power input panel. If desired, the electrotyper a-c power cord can be connected to the 115V ac power output receptacle on the OSCAR Model K. When connected in this manner, the power ON-OFF switch (2, figure 3-1) on the OSCAR Model K also switches a-c power to the electrotyper.

3-6. If an IBM Keypunch Type 024 or Type 026 is to be used, connect its signal cable to the KEYPUNCH outlet receptacle on the power input panel. If desired, the keypunch a-c power cord can be connected to the 115V ac power output receptacle on the OSCAR Model K. When connected in this manner, the power ON-OFF switch (2) on the OSCAR Model K also switches power to the keypunch.

3-7. INSTALLING THE RECORD.

NOTE

Before inserting and positioning the record, it is desirable to mark on it the maximum and minimum points for each trace to be read, as well as the numerical values of the maximum and minimum points. These marks should be placed on the record after checking the calibration of the recording instrument. If the recorder's calibration curve is linear, it is only necessary to mark the maximum and minimum points, since the calibration will be a straight line. If the calibration is non-linear, it is only necessary to mark the maximum and minimum points, since the calibration will be a straight line. If the calibration is non-linear, there should be calibration steps on the record, on which numerical values should be marked. Aligning the record to the same points each time the record is moved forward or back, it will then only be necessary to edit the oscillograph and mark values on it once at the start of the reading.

3-8. Rolled records can be installed initially on the left-hand record spindle (41) or the right-hand record spindle (27). Following instructions are for initial loading on the left-hand record spindle.

3-9. Pull the top end of the left-hand record spindle (41) forward from its slot. Press the clamp bar and slide the record over the clamp bar and spindle shaft so that the record unrolls from the rear of the spindle. Feed the record under the left-hand magnetic record holder (40), across the viewing screen, under the right-hand magnetic record holder (28) and load it on the right-hand record spindle (27), so that the record enters at the rear of the spindle. Wrap several turns of the record around the right-hand record spindle, and rotate the right-hand record spindle by hand until the record is smooth across the viewing screen.

3-10. Turn the OFF-1-2 illumination selector switch (1) to the desired level of illumination intensity.

3-11. ALIGNING THE READING HEAD.

3-12. The reading head (32) is aligned to the record by adjusting the position of the reading head traverse bar (39). The reading head traverse bar is held in position by clamps at either end. The left-hand record alignment knob (41) and right-hand record alignment knob (31) operate the clamps.

3-13. After marking the record (see NOTE in paragraph 3-7) and installing the record (see paragraphs 3-8 through 3-10), observe any convenient horizontal mark on the record. Adjust the position of the reading head so that the horizontal reference on the record crosses identical points on the vertical scales at the right- and left-hand sides of the reference line overlay (38). This is accomplished by loosening either record alignment knob (31 or 41) and positioning the reading head traverse bar (39) so that the scales on the reference line overlay (38) are aligned to the horizontal reference line on the record.

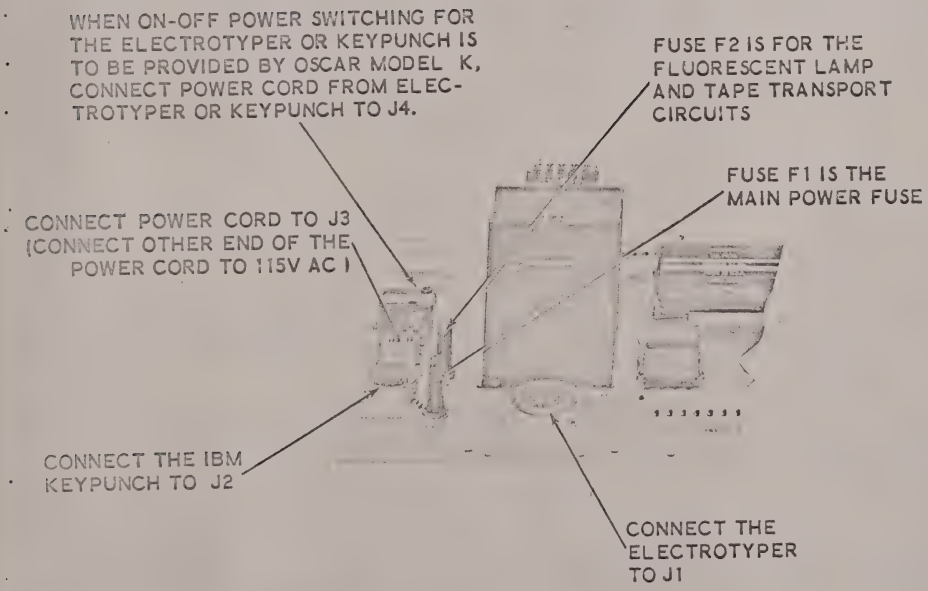

WHEN ON-OFF POWER SWITCHING FOR THE ELECTROTYPER OR KEYPUNCH IS TO BE PROVIDED BY OSCAR MODEL K, CONNECT POWER CORD FROM ELECTROTYPER OR KEYPUNCH TO J4.
FUSE F2 IS FOR THE FLUORESCENT LAMP AND TAPE TRANSPORT CIRCUITS
FUSE F1 IS THE MAIN POWER FUSE
CONNECT POWER CORD TO J3 (CONNECT OTHER END OF THE POWER CORD TO 115V AC)
CONNECT THE IBM KEYPUNCH TO J2
CONNECT THE ELECTROTYPER TO J1

Figure 3-2. Location of Connectors and Fuses

3-14. PREPARING THE SCALED AMPLITUDE OVERLAY.

3-15. Seldom does the scale of the record conform to the scale of the OSCAR Model K. To translate the scale of the record into the scale of the OSCAR, a calibration line is drawn on the scaled amplitude overlay.

3-16. TRACE VARYING BETWEEN ZERO AND A POSITIVE VALUE.

3-17. To prepare a calibration line for a trace which varies between zero and a positive reading, proceed as follows:

a. Place the scaled amplitude overlay in the scaled amplitude overlay holder.

b. Turn the record time alignment control knob (37) to place the vertical reference line over a 0 (zero) calibration mark on the record.

c. Turn the record amplitude alignment control knob (33) fully clockwise and press the record push-button switch (36) on the reading head. The Y AXIS nixie bank should read 000. If they do not, adjust the right-hand record alignment knob (see par. 4-7).

d. Place a mark on the scaled amplitude overlay over the point at which the vertical reference line and the minimum calibration mark intersect.

e. Turn the record time alignment control knob (37) until the vertical reference line intersects the maximum calibration mark on the record.

f. Turn the record amplitude alignment control knob (33) counterclockwise until the value of the maximum calibration mark appears on the Y AXIS nixie bank.

g. Place a mark on the scaled amplitude overlay over the point where the vertical reference line intersects the maximum calibration mark.

h. Remove the scaled amplitude overlay from its holder and draw a line on its reverse side connecting the two dots. Use a straight edge and sharp pencil or fine ruling pen.

i. Replace the scaled amplitude overlay in its holder.

j. Repeat steps b through f above to check the accuracy of the calibration line.

3-18. TRACE VARYING BETWEEN ZERO AND A NEGATIVE VALUE.

3-19. The procedure for preparing a calibration line for a trace varying between zero and a negative value is identical to that contained in paragraph 3-16 above. The slope of the calibration line will be negative. The operator must remember to operate the +/- control switch (35) to the - (minus) position when recording negative values.

3-20. TRACE VARYING BETWEEN A NEGATIVE VALUE AND A POSITIVE VALUE.

3-21. In preparation of a calibration line (actually two lines intersecting at zero) for a trace varying between a negative value and a positive value, three calibration marks on the record are required; one at positive maximum; one at zero; and one at negative maximum.

3-22. To prepare a calibration line for a trace varying between a negative value and a positive value, first prepare a calibration line following the procedure of paragraph 3-16 above, using the maximum positive and zero calibration marks on the record. Second, prepare a calibration line following the procedure of paragraph 3-18 above, using the zero and maximum negative calibration marks on the record. This procedure will result in two lines intersecting at zero, positive values of the trace will be read from the calibration line of positive slope, and negative values of the trace will be read from the calibration line of negative slope.

3-23. TRACE VARYING BETWEEN TWO POSITIVE VALUES.

3-24. To prepare a calibration line for a trace varying between two positive values, for example +125 and +875, proceed as follows:

a. Place the scaled amplitude overlay in the scaled overlay holder.

b. Turn the record time alignment control knob (37) to position the vertical reference line over the 125 calibration mark on the record.

c. Turn the record amplitude alignment control knob (33) clockwise to 000, then counterclockwise to 125. Press the record pushbutton switch (36) on the reading head. With the switch pressed, approximately 125 will show on the Y AXIS nixie bank. Trim the setting of the record amplitude alignment control knob (33) to produce a reading of 125 on the Y AXIS nixie bank.

d. Place a mark on the scaled amplitude overlay over the point at which the vertical reference line and the 125 calibration mark intersect.

e. Turn the record time alignment control knob (37) until the vertical reference line intersects the 875 calibration mark.

f. Turn the record amplitude alignment control knob (33) until 875 appears on the Y AXIS nixie bank.

g. Place a mark on the scaled measurement overlay over the point where the vertical reference line and the 875 calibration mark intersect.

h. Remove the scaled measurement overlay and draw a line connecting the two dots. Draw the line on the reverse side. Use a straight edge and a sharp pencil or ruling pen.

i. Replace the scaled measurement overlay in its holder and repeat steps b, c, and e above to check the accuracy of this procedure.

3-25. NON-LINEAR TRACE.

3-26. The amplitude of a trace may be non-linear (either due to characteristics of the recording device, or to characteristics of the recorded function). To prepare a scaled amplitude for such a trace, either of two procedures may be used.

3-27. ONE-POINT PROCEDURE. If several calibration values are available on the record, locate one calibration point on the scaled amplitude overlay for each calibration mark on the record. Connect the calibration points on the scaled amplitude overlay in a smooth curve.

3-28. TWO-POINT PROCEDURE. If only two calibration points are available on the record, locate the two points on the scaled amplitude overlay. A mathematician or engineer can calculate and plot other points from which a curve can be drawn on the scaled amplitude overlay.

3-29. CURVILINEAR TRACE.

3-30. Some types of pen recorders produce records of curvilinear coordinates. The coordinates printed on recording paper used in such recorders furnishes a convenient aid in constructing a calibration curve for such records. Trace one of the curved time reference lines from the record paper on a piece of thin acetate, and proceed as for records with linear traces.

3-31. MULTIPLE TRACES.

3-32. To prepare an overlay for a record with multiple traces, prepare a separate calibration line for each trace on the same scaled amplitude overlay holder, according to instructions given previously for single traces. Code or number the calibration line with the trace number.

3-33. RECORDING PROCEDURE.

3-34. A typical recording procedure for a multiple trace record, with patchboard connected so that the time line count is advanced by the channel counter is given. Before entering this procedure, edit the record (see paragraph 3-7) and construct calibration lines or curves on the scaled amplitude overlay (see paragraphs 3-11 through 3-31), then proceed as follows:

a. Turn the power ON-OFF switch (2) to the ON position.

b. If the recording devices have separate power switches, turn them to their ON positions.

c. Install the record (see paragraphs 3-7 through 3-10).

d. Align the reading head (see paragraph 3-11).

e. Using the TIME LINE COUNTER ENTER-CLEAR switches (5), (6), (7), and (8), set the TIME LINE COUNTER nixie bank (4) to the time line count of the first reading.

f. Set the MULTIPLIER switch (3) and TIME LINE COUNTER decade selector switch (9) to advance the time line count the desired number of digits between readings.

g. Set mode selector switch (10) to AUTO. position.

h. Set the CHANNEL COUNTER decade selector switches (11 and 15) to one digit more than the number of traces to be read on the record.

i. Using the CHANNEL COUNTER CLEAR-ENTER switches (12) and (14), set the CHANNEL COUNTER nixie bank to 01 (or other digit if it is planned to start reading with a trace other than 1).

j. Turn the output selector switch (20) to accomodate the type of output device connected to the OSCAR Model K: TYPER, TYPER/PUNCH, or PUNCH.

k. Turn the fixed data switches (21 through 26) to their OMIT positions or to the numbers required by the program.

l. Press the RESET pushbutton switch (19) to insure that the output scanner stepping switch is reset.

m. Turn the record time alignment control knob (37) to position the vertical reference line over the record at the time of the first reading.

n. Turn the record amplitude alignment control knob (33) until the calibration line for the first trace intersects the vertical reference line at the point of intersection of the first trace.

o. Operate the +/- control switch (35) on the reading head to the appropriate position.

p. Press the record pushbutton switch (36) on the reading head.

q. Operate the keypak (29) to add the required characters and return by typer carriage.

r. Repeat steps n through q above for the remaining traces.

s. Repeat step m above for the second time position it is desired to record.

t. Repeat steps n, o, p, q, and s above as required to process the record.

3-35. ALTERNATE PROCEDURES.

3-36. The procedure given in paragraph 3-34 can be altered in many ways to suit the needs of the customer by arrangement of the patchboard connections and use of the DEMAND READOUT switch (16).

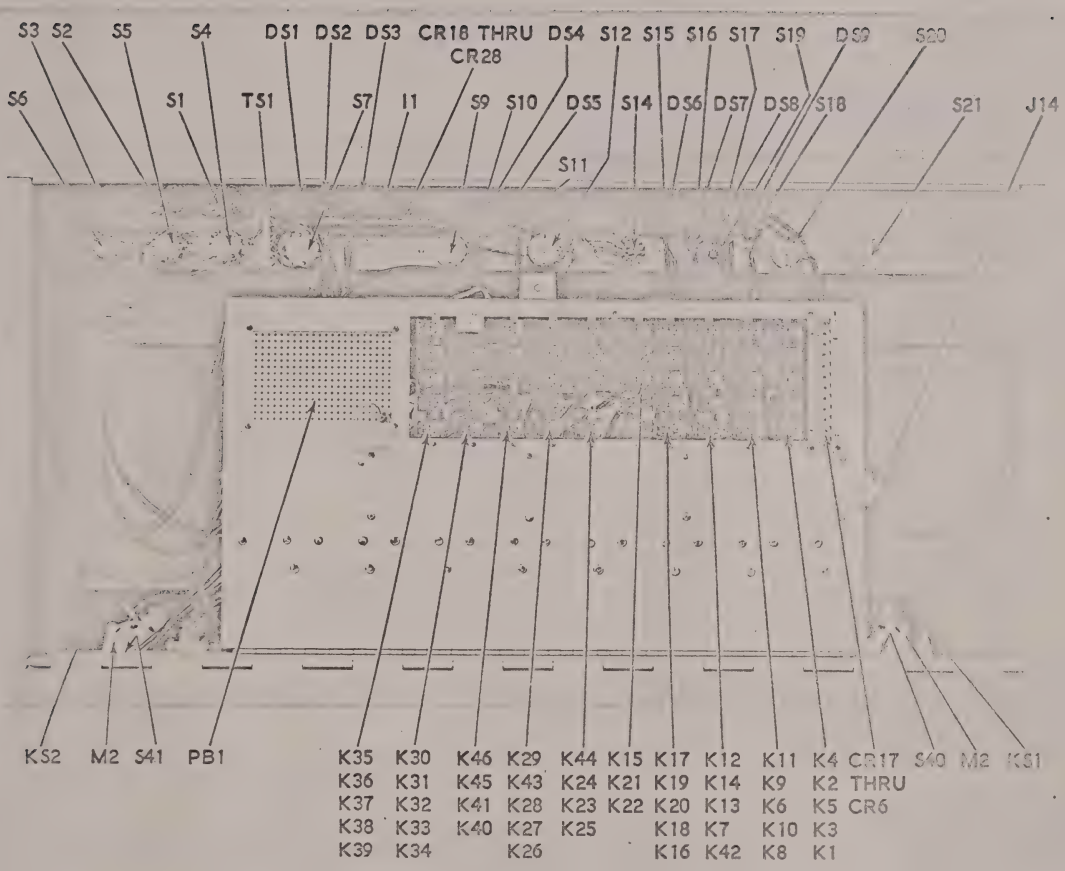


Figure 4-1. Location of Replaceable Parts (Sheet 1 of 2)

section IV
maintenance

4-1. GENERAL.

4-2. This section contains only those troubleshooting and maintenance instructions which can be performed by the equipment operator. Maintenance and minor repairs other than those covered in this section should only be performed by an authorized Benson-Lehner technician. Under no circumstances should major overhaul be attempted in the field.

4-3. TROUBLESHOOTING.

4-4. Many of the malfunctions which may be encountered by the operator will be caused by improper positioning of the controls. Table 4-1 lists the troubles which are most likely to occur, the most probable cause of the troubles, and the corrective action to be taken.

4-5. LOCATION OF PARTS.

4-6. Figure 4-1, sheets 1 and 2, shows the locations of the replaceable parts in the OSCAR Model K and identifies the parts by their reference designators (see the schematic diagram in the back of this manual).

4-7. PRELIMINARY TEST.

4-8. The following test can be performed to ascertain that the major circuits in the OSCAR Model K are operating. Perform the test as follows:

a. Place the power ON-OFF switch (2, figure 3-1) in the ON position.

b. Turn the record amplitude alignment control knob (33) to its full clockwise position. The Y AXIS nixie bank (18) should read 000. If a 000 reading is obtained, proceed with step c below. If a reading of 000 is not obtained, proceed as follows:

(1) Loosen the Allen-head screws in the shoulder bushings on the traverse bar behind the reading head (32).

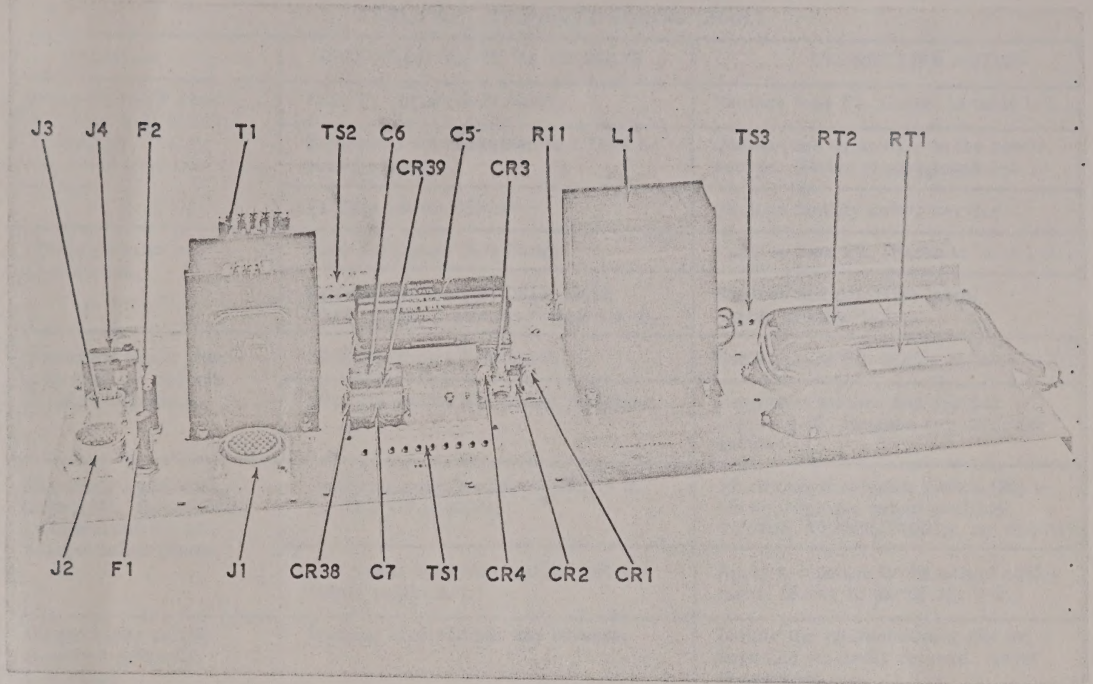
(2) Slide the bushings right or left a small distance as required to obtain a reading of 000 on the Y AXIS nixie bank, then tighten the Allen-head screws securely.

NOTE

Positions 000 and 999 on the record amplitude control knob (33) are very close. If the shoulder bushings (step b above) are not properly positioned, the Y AXIS nixie bank may read 999 when the record amplitude control knob is placed in its full clockwise position.

c. If a reading of 000 is obtained in step b above, turn the record amplitude alignment control knob (33) in a counterclockwise direction to obtain readings on the Y AXIS nixie bank of 111, 222, 333, 444, 555, 666, 777, 888, and 999, in turn.

d. If any of the readings cannot be obtained in step c above, or if the readings are erratic, it is an indication of a circuit failure within the OSCAR Model K.



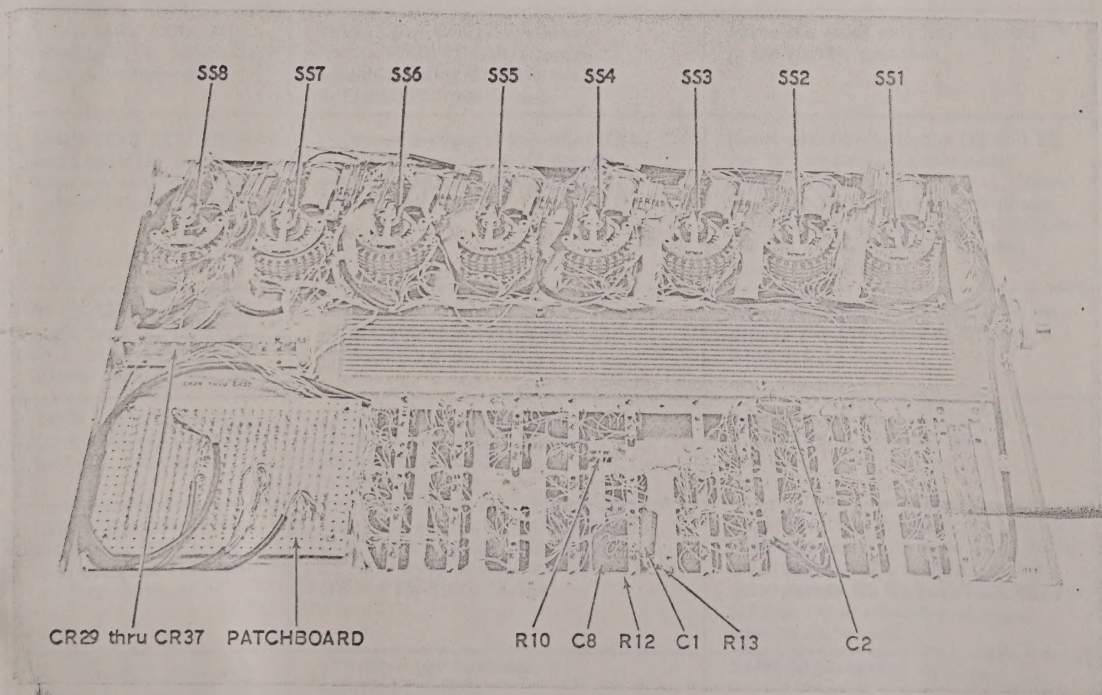


Figure 4-1. Location of Replaceable (Sheet 2 of 2)

TABLE 4-1. TROUBLESHOOTING CHART

TROUBLE	PROBABLE CAUSE OF TROUBLE	CORRECTIVE ACTION
Power ON-OFF switch (2, figure 3-1) is in the ON position, but the equipment does not operate.	Fuse F1 (figure 3-2) blown.	Replace fuse F1. (Refer to table 1-2.)
	Equipment not connected to a 115V ac power source.	Connect the equipment to the power source. (Refer to paragraph 3-3.)
	Facility power failure.	Restore facility power service.
Viewing screen not illuminated.	Fuse F2 (figure 3-2) blown.	Replace fuse F2. (Refer to table 1-2.)
	Fluorescent lamp(s) DS11, DS12, DS13, or DS14 defective (figure 4-4).	Replace and defective lamp. (Refer to table 1-2.)
Motorized paper transport does not operate in either direction.	Fuse F2 (figure 3-2) blown.	Replace fuse F2. (Refer to table 1-2.)
	Mercury switch S40 or S41 defective.	Readjust switches S40 and S41 (figure 4-4). Replace any defective switch.
The record pushbutton switch (33, figure 3-1) is depressed but no readout takes place.	Output selector switch S7 (20) is in the SET UP position.	Place output selector switch (20) in the appropriate output position: TYPER, TYPER/PUNCH, or PUNCH.
	A-c power not being applied to the output equipment.	Apply a-c power to the output equipment. (Refer to paragraph 3-3.)
Electrotyper output functions properly, then stops.	Sticking electrotyper key or keys.	Isolate the malfunctioning key or keys and manually release. Reset if required.
TIME LINE COUNTER nixie bank (4, figure 3-1) does not read out.	TIME LINE COUNTER MAN.-AUTO.-COUNT ONLY mode selector switch S14 (10) not set in the AUTO. position.	Place the mode selector switch (10) in the AUTO. position.
TIME LINE COUNTER nixie bank (4, figure 3-1) does not read out at the proper time interval.	Improper setting of the CHANNEL COUNTER tens or units decade selector switches S12 and S9 (11 and 15, figure 3-1).	Reset selector switches (11 and 15) for the required channel count. (Refer to index 11, table 3-1.) Reset the CHANNEL COUNTER tens and units decade CLEAR-ENTER switches (12 and 14) to clear the channel counter nixie bank.
TIME LINE COUNTER nixie bank (4, figure 3-1) will not advance the required count.	TIME LINE COUNTER MULTIPLIER selector switch S20 (3) improperly positioned.	Place the selector switch (3) in its proper position. (Refer to index 3, table 3-1.)
TIME LINE COUNTER nixie bank (4, figure 3-1) will not advance.	TIME LINE COUNTER MAN.-AUTO.-COUNT ONLY mode selector switch S14 (10) is set in MAN. position.	Place the selector switch (10) in the AUTO. or COUNT ONLY position.
CHANNEL COUNTER nixie bank (13, figure 3-1) does not read the number of traces.	Improper setting of the CHANNEL COUNTER tens or units decade selector switches S12 and S9 (11 and 15, figure 3-1).	Reset selector switches (11 and 15). (Refer to index 11, table 3-1.) Reset the CHANNEL COUNTER tens and units decade CLEAR-ENTER switches (12 and 14) to clear the channel counter nixie bank.
Y AXIS nixie bank (18, figure 3-1) will not read 000.	Traverse bar bushings not adjusted properly.	Refer to paragraph 4-7.